

Mitral Valve Repair in a Sub-Saharan African Country (Benin): Initial Experience and Short-term Outcomes

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ABSTRACT

Introduction: Mitral valve repair offers significant advantages in terms of morbidity and mortality over mitral valve replacement, and is best suited to developing countries given the high cost of prostheses and lifelong anticoagulation. The objective of this study was to assess the short-term outcomes of mitral valve repair in Benin.

Method: This was a prospective study including all patients who underwent mitral valve repair at the Hubert Koutoukou Maga National University Hospital Center in Benin between March 2021 and October 2024.

Results: Twenty patients were included, with a mean age of 45.9 ± 13.6 years and a male-to-female ratio of 1.5. Dyspnea was the predominant symptom (90.0%). Isolated mitral regurgitation was observed in all patients, with a mean left ventricular ejection fraction of $61.3 \pm 9.4\%$ and a mean pulmonary artery systolic pressure of 57.8 ± 17.6 mmHg. Rheumatic etiology accounted for 60% of cases. The mean cardiopulmonary bypass time was 92.8 ± 34.2 min, with a mean cross-clamping time of 66.6 ± 27.3 min. Annuloplasty was performed in 95% of patients. The most frequent concomitant procedure was tricuspid valve repair (50%). Ninety-day mortality was 5%.

Conclusion: Mitral valve repair is a preferable alternative to valve replacement. The complexity of the lesions involved renders this procedure challenging, and optimal results can only be achieved through rigorous patient selection and precise lesion analysis. These short-term findings are encouraging, and call for further advancements.

Keywords

Mitral Valve Repair, Rheumatic Heart Disease, Sub-Saharan Africa.

Introduction

Mitral valve disease accounts for nearly 60% of valvular disorders in sub-Saharan Africa [1,2]. Rheumatic heart disease is the most common cause, primarily affecting young people and

women [3,4]. Despite the high cost of valve prostheses and the often suboptimal management of post-operative anticoagulation, mechanical valve replacements remain the preferred option in sub-Saharan Africa, largely because of high failure and re-intervention rates associated with the technical demands of mitral valve repair [3,5]. However, the demonstrated advantages of mitral valve repair over valve replacement in terms of morbidity and mortality, together with recent encouraging advances in repair techniques for

rheumatic heart disease, are prompting a reassessment of routine prosthesis use in the complex socio-economic context of sub-Saharan regions [3,6,7]. The aim of this study was to describe the short-term outcomes of the first mitral valve repairs performed in Benin, where a new cardiac surgery program has recently been established.

Methods

This was a prospective descriptive study conducted from March 2021 to October 2024, including patients who underwent mitral valve repair at the Hubert Koutoukou Maga National University Hospital Center in Benin. This study included an exhaustive series of all patients undergoing mitral valve repair during the study period; no patient was excluded.

Study variables included sociodemographic, preoperative, surgical, and follow-up data. Data were collected and analyzed using KoboCollect. For descriptive analysis, quantitative variables were expressed as means ± standard deviation or as medians with interquartile range after verifying normality with the Shapiro-Wilk test. Categorical variables were described as proportions or frequencies. Informed consent was obtained from all participants, and the necessary authorizations from the Hubert Koutoukou Maga National University Hospital Center were secured.

Results

Preoperative Data

During the study period, among 82 patients who underwent mitral surgery, 20 (24.4%) underwent mitral valve repair and 5 (6.1%) experienced repair failure. The mean age was 45.9 ± 13.3 years (range: 16–66 years). Twelve (60.0%) were male, yielding a male-to-female ratio of 1.5. The mean body mass index was 24.2 ± 5.6 kg/m².

Dyspnea was the primary presenting symptom in 90.0% of cases. Seventeen patients (85%) had cardiomegaly, and 95% showed indirect signs of pulmonary arterial hypertension (PAH). The mean cardiothoracic index was 0.6 ± 0.07 (range: 0.5–0.7). Atrial fibrillation was observed in 15.0% of cases. Rheumatic etiology was identified in 60.0% of patients. All patients had isolated mitral regurgitation, with 35% classified as moderate and 65% as severe. Left ventricular ejection fraction was generally preserved, with a mean of 61.3 ± 9.4% (range: 40–74%). The mean pulmonary artery systolic pressure was 57.8 ± 17.7 mmHg (range: 28–93 mmHg) (Table 1).

Intraoperative Data

All patients underwent total median sternotomy and aortobicaval cannulation. Normothermic blood cardioplegia was administered anterogradely. The duration of cardiopulmonary bypass was 92.8 ± 34.2 minutes (range: 25–153 minutes), and the mean aortic clamping time was 66.6 ± 27.3 minutes (range: 18–103 minutes). The mitral valve was exposed via left atriotomy. The most common procedure was annuloplasty (95%), followed by commissuroplasty A3-P3 and the Alfieri technique, each performed

in 25% of cases. Four patients (20%) underwent P2 plication, and three patients (15%) underwent neochordal repair. Two patients (10%) underwent quadrangular resection, and one patient (5%) received a pericardial patch. An associated tricuspid valve repair was performed in 10 patients (50%) (Figures 1 and 2) (Table 2).

Table 1: Preoperative Data for Patients Who Underwent Mitral Valve Repair in Benin (N=20).

	Values
Gender	
Male, n (%)	12 (60%)
Female, n (%)	8 (40%)
Age (years), mean ± SD (range)	45,9 ± 13,3(16-66)
Symptoms	
Dyspnea	
NYHA Stage II, n (%)	7 (35%)
NYHA Stage III, n (%)	5 (25%)
NYHA Stage IV, n (%)	8 (40%)
Palpitations, n (%)	12 (80%)
Syncope, n (%)	2 (10%)
Hemiplegia, n (%)	1 (5%)
Radiographic signs	
Cardiomegaly, n (%)	17 (85%)
Indirect signs of PAH, n (%)	17 (85%)
Electrocardiographic signs	
Left ventricular hypertrophy, n (%)	6 (30%)
Left atrial hypertrophy, n (%)	6 (30%)
Atrial fibrillation, n (%)	3 (15%)
Left Ventricular Ejection Fraction, mean ± SD (range)	57,8±9,4% [35-76]
Pulmonary Artery Systolic Pressure, mean ± SD (range)	57,8±17,7 [20-98]
Regurgitant orifice area (mm²), mean ± SD (range)	49,6±17,7 [22-106]
20-40, n (%)	7 (35%)
> 40, n (%)	13 (65%)
Associated lesions	
Severe tricuspid regurgitation, n (%)	10 (50%)
Mixed aortic valve disease, n (%)	4 (20%)
Left Atrial Myxoma, n (%)	2 (10%)
Atrial septal defect, n (%)	1 (5%)
Etiology	
Rheumatic, n (%)	12 (60%)
Degenerative, n (%)	3 (15%)
Tumoral, n (%)	2 (10%)
Endocarditis, n (%)	2 (10%)
Congenital, n (%)	1 (5%)

Table 2: Intraoperative Data and Postoperative Outcomes for Patients Who Underwent Mitral Valve Repair in Benin (N=20).

	Values
Cardioplegia	
Blood, n (%)	20 (100%)
Central temperature	
Normothermia, n (%)	20 (100%)
Cardiopulmonary Bypass time, mean ± SD (range)	92,8±34,2 [25-153]
Cross clamping time, mean ± SD (range)	66,6±27,3 [18-103]
Mitral valve exposure	
Left atriotomy, n (%)	20 (100%)
Surgical procedures performed	
Annuloplasty, n (%)	19 (95%)
Commisuroplasty A3-P3, n (%)	5 (25%)
Alfieri Technique, n (%)	5 (25%)
P2 Plication, n (%)	4 (20%)
Neochordal Repair, n (%)	3 (15%)
Quadrangular resection, n (%)	2 (10%)
Pericardial patch, n (%)	1 (5%)

	Values
Associated surgical procedures	
Tricuspid valve repair, n (%)	10 (50,0%)
Left atrium appendage closure, n (%)	7 (35,0%)
Aortic valve replacement, n (%)	4 (20,0%)
Myxoma resection, n (%)	2 (10,0%)
Atrial septal defect Closure, n (%)	1 (5,0%)
Post-operative LVEF, mean $\pm$ SD (range)	44,7 $\pm$ 12,1 (20-60)
Reduction in Pulmonary Artery Systolic Pressure (mmHg), mean $\pm$ SD (range)	26,8 $\pm$ 15,4 (7-56)
Post-operative complications	
Pneumonia, n (%)	4 (20,0%)
Third-Degree Atrioventricular Block, n (%)	3 (15,0%)
Bleeding, n (%)	3 (15,0%)
Acute Renal Failure, n (%)	2 (10,0%)
Convulsive Seizures, n (%)	1 (5,0%)
Cardiac Tamponade, n (%)	1 (5,0%)
Mortality at 90 Days	
Time to Death	4

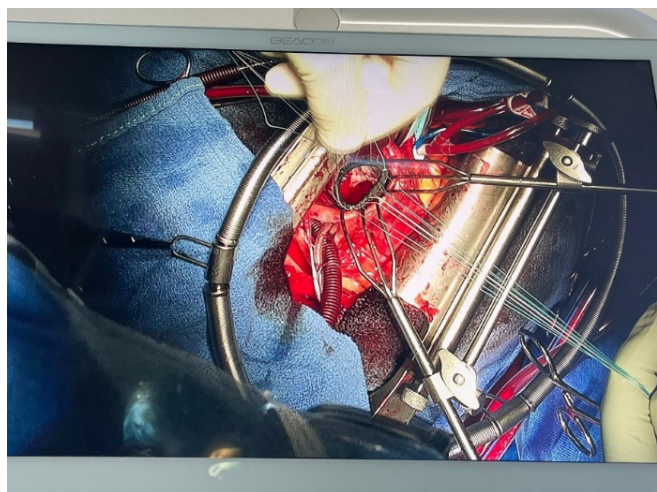


Figure 1: Intraoperative view of mitral annuloplasty.

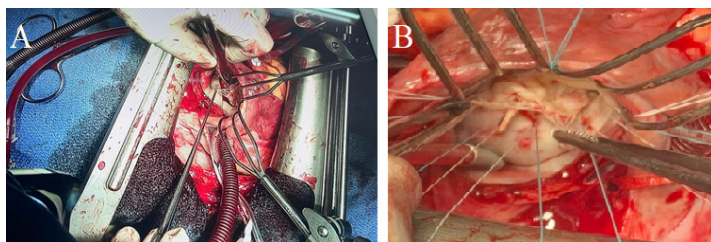


Figure 2: Intraoperative view of mitral valve repair by insertion of neochordae on the anterior leaflet.

(A) Intraoperative assessment revealing rupture of chordae tendineae of the anterior mitral leaflet.

(B) Visualization of neochordae inserted on the free margin of the anterior mitral leaflet.

Postoperative Data

At 90 days postoperatively, there was a marked regression of dyspnea, with all patients classified as NYHA I–II, and a mean reduction in pulmonary artery systolic pressure of 25.8 mmHg (range: 7–56 mmHg). Postoperative complications included pulmonary complications in 20% of patients, third-degree

atrioventricular block in 15% (requiring pacemaker implantation), bleeding in 15%, acute renal failure in 10%, convulsive seizures in 5%, and tamponade in 5%. One death occurred within the first 90 days postoperatively, corresponding to a mortality rate of 5% (Table 2).

Discussion

The burden of rheumatic disease remains high in low- and middle-income countries, affecting 33 million people worldwide and causing approximately 320,000 deaths annually [8,9]. In our series, 60% of patients had rheumatic valve disease, which aligns with existing literature on the persistent impact of rheumatic fever in Africa [10,11]. However, the mean age in our study (45.9 years) is significantly higher than that reported in several African series (between 7 and 25 years), suggesting delayed diagnosis and management in our context [10,11]. The relatively younger age of patients undergoing repair makes mitral valve repair even more beneficial, as preservation of the subvalvular apparatus helps maintain optimal left ventricular function and enhances quality of life [3].

The observed male predominance (60% male) differs from the female predominance typically reported in the literature [10–12]. Isolated mitral regurgitation was the dominant lesion (100%), consistent with other African series reporting frequencies between 61.5% and 78% [10,11]. However, mitral valve repair was performed in only 24.4% of mitral surgeries, reflecting the complexity and advanced stage of the lesions.

The mean durations of cardiopulmonary bypass (92.8 ± 34.2 minutes) and aortic clamping (66.6 ± 27.3 minutes) are within the ranges reported in the African literature, where bypass times vary between 80.9 and 84 minutes and clamping times between 49.1 and 61.5 minutes [10,11]. These discrepancies may be attributable to the limited experience of the local team.

Annuloplasty, performed in 95% of patients, aligns with literature reports (84%–100%), underscoring its critical role in stabilizing the repair [10,11]. Short-term outcomes were satisfactory, with an in-hospital mortality rate of 5% and significant improvements in both dyspnea and pulmonary artery systolic pressure (mean reduction of 25.8 mmHg). This mortality rate is comparable to those reported in other African series (2%–3.8%) [10,11].

Limits of This Study

The small sample size and the limited duration of follow-up, which precludes an evaluation of medium- and long-term outcomes, are notable limitations. Nevertheless, these preliminary findings suggest that mitral valve repair is both feasible and safe in Benin, offering significant short-term hemodynamic benefits. However, further consolidation of these results will require a more structured multidisciplinary approach, improved early detection, and prolonged follow-up to ascertain the durability an essential factor for truly improving the prognosis of rheumatic valve disease in our region.

Conclusion

Mitral valve repair appears to be an attractive treatment option for rheumatic mitral regurgitation in sub-Saharan Africa, particularly given the younger age of affected patients and its demonstrated advantages over valve replacement. Nevertheless, it requires greater surgical expertise because of the high risk of repair failure and re-intervention. In our context, early results are satisfactory, with reduced operative mortality and significant clinical improvement. However, these observations must be confirmed by long-term follow-up, considering the progressive nature of rheumatic valve disease. Enhancements in surgical infrastructure, continuous team training, and intensified prevention of rheumatic fever may collectively help to increase the rate of successful mitral valve repairs and ensure enduring outcomes in our regions.

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